STATE POLICY INITIATIVES AND AGRICULTURAL DEVELOPMENT: A CASE STUDY OF KARNATAKA

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STATE POLICY INITIATIVES AND AGRICULTURAL DEVELOPMENT: a case study of Karnataka, India

H G Hanumappa*

INTRODUCTION

Karnataka State has 5.8 per cent (19.2 million sq. kms.) of the geographical area and 5.3 per cent of the population (45 million) of the country (1991 census). The density of population in the State was 235 persons per sq. km. (257 for India). Till recently Karnataka State had 20 revenue districts and they have been increased to 27 for reasons of administrative convenience. The decadal growth rate of population between 1961-71 and 1981-91 shows a gradual decline from 24.22 per cent (1961-71) to 20.69 per cent (1981-91), whereas, all India growth rates have declined marginally from 25 per cent (1961-71) to 24 per cent (1981-91). Further, in Karnataka, there was a decline in the share of rural population, from 78 per cent in 1961 to 69 per cent in 1991 and increase in the share of urban population from 22 per cent in 1961 to 31 per cent in 1991. Among other important demographic features, the average family size in Karnataka was almost the same as the all-India average of 5.50 persons. The proportion of population engaged as cultivators and agricultural labourers (main workers) was estimated at 109.16 lakhs (63 per cent of the total main workers of the State as per 1991 Census).

This paper attempts to present the problems and prospects of Karnataka's agriculture in the light of certain policy changes initiated by the provincial government of Karnataka [under the Constitution of India, agriculture is a state (provincial) subject] by adopting an Agricultural Policy Resolution in 1995 (Government of Karnataka, 1995A). Part One deals with the crop production and productivity related issues including infrastructure problems like water and crucial issues like price and employment. Part Two deals with policy issues concerning various aspects.

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of agricultural development. Part Three deals with prospective issues in agricultural development followed by concluding remarks.

PART ONE

KARNATAKA AGRICULTURE: TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY

Agriculture plays an important role in Karnataka's economy. It contributed nearly 36.0 per cent to the SDP in 1994-95 (at 1980-81 prices). In terms of per capita income at current prices (1994-95) Karnataka had Rs. 8,237. At constant prices (1980-81) the per capita income of Karnataka during 1994-95 was Rs. 2,467.

The area under cereals was 62.7 lakh hectares in 1960-61 with output at 35.8 lakh tonnes. By 1980-81, the area had declined to 55.7 lakh ha. which increased to 59.1 lakh ha. in 1989-90 with output at 57.1 and 65.1 lakh tonnes respectively. By 1992-93, the area under cereals declined to 54 lakh ha, but cereal output was estimated at 86 lakh tonnes. There has been an increase in area under pulses from 13.1 lakh ha in 1960-61 to 16.6 lakh in 1993-94.

However, since 1970-71, the production of pulses has not increased appreciably. It was 5.1 lakh tonnes in 1970-71 and declined to 4.9 lakh tonnes in 1980-81 and picked up to 6 lakh tonnes by 1993-94. In the case of oilseeds (mainly groundnut), the area increased by 1980-81 from 12 lakh ha (1960-61) to 14 lakh ha (1980-81), it increased sharply to 32 lakh ha by 1994-95. Sunflower and groundnut covered 21 lakh ha (1994-95) and the output of these crops was estimated at 13 lakh tonnes (1994-95).

The average growth of foodgrain production in Karnataka as compared to the national average indicates that during the sixth and seventh plan periods, the growth rate in Karnataka was very low. It was practically stagnant during 1980-81 to 1984-85 while it was about half (1.94%) that of India (3.64%) during 1985-86 to 1989-90. Changes in the four year average crop yield level during the period 1986-90 over 1977-81 showed that there was a negative trend in the yield level of all the crops except bajra, kharif groundnut, cotton and sugarcane. Cereals like paddy, jowar, ragi and maize; pulses like tur and gram; and oilseeds like sunflower showed varying negative yields. It is important to note that the contribution of agriculture to state domestic product is mainly from the crop sector. The production and productivity of field crops largely influenced the state domestic product and income of the people.
Agricultural production or rather productivity in the State was stagnant during the late 80's and the Government of Karnataka appointed a Committee (Govt. of Karnataka, 1993) to probe into the causes of stagnation and suggest remedial measures. However, during the early 90s there was a marked improvement in agricultural production as well as in productivity.

The stagnation in productivity of foodgrains noticed in the 80's seems to have marginally improved during the first three years of 1990s. This is evident from the fact that even though the area under food crops has declined from 76 lakh ha in 1989-90 to 73 lakh ha in 1992-93, the production of foodgrains has increased from 71 lakh tonnes in 1989-90 to 86 lakh tonnes in 1992-93. The estimated output of cereals for the year 1997-98 is put at 92 lakh tonnes, which is quite substantial. In the case of oilseeds, the area has increased from 23 lakh ha in 1989-90 to 32 lakh hectares in 1994-95. Similarly, the output of oilseeds has increased from 15 lakh tonnes in 1989-90 to 18 lakh tonnes in 1992-93. Likewise one can find marginal increase in the output of cotton and sugarcane during 1992-93 when compared to 198-90. In view of this trend it may be noted, that there is an indication of increased overall productivity of some of these crops.

The production of maize in the State increased roughly by 8 per cent per annum in the recent times whereas the long term growth rate was 15.5 per cent per annum. The growth in the production of maize came through both expansion in area and increased productivity (Table 1). The area under two major pulses i.e. chickpea and pigeonpea increased by 4 and 2 per cent respectively despite the deceleration in the yield levels during 1980-81 and 1993-94. The same was true with sunflower. The introduction of technology mission for oilseeds and pulses and a favourable price policy regime might have helped in the expansion of area and augmenting production of oilseeds and pulses.

The area under cotton decelerated at the rate of 4 per cent per annum despite more than 7 per cent growth observed in productivity during the last decade. Sugarcane production increased roughly by 6 per cent per annum during the last decade as against 5 per cent growth experienced during 1955-56 through 1993-94. The increase in the area under sugarcane with the expansion of irrigation coupled with modest rise in productivity resulted in increased production of sugarcane in the state. As could be seen from Table 1, the peak and trough years for pulses, oilseeds and cotton do indicate, that technology coupled with
### Table 1: Compound Growth Rates of Production, Area and Productivity of Important Crops

<table>
<thead>
<tr>
<th>Crops</th>
<th>Production</th>
<th>Area</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
<td>P2</td>
<td>P3</td>
</tr>
<tr>
<td>Rice</td>
<td>2.21</td>
<td>0.47</td>
<td>2.39</td>
</tr>
<tr>
<td>Wheat</td>
<td>2.73</td>
<td>5.64</td>
<td>-2.11</td>
</tr>
<tr>
<td>Jowar</td>
<td>1.26</td>
<td>5.63</td>
<td>0.50</td>
</tr>
<tr>
<td>Ragi</td>
<td>2.17</td>
<td>6.60</td>
<td>1.14</td>
</tr>
<tr>
<td>Maize</td>
<td>15.52</td>
<td>11.00</td>
<td>7.90</td>
</tr>
<tr>
<td>P.Millet</td>
<td>2.19</td>
<td>6.03</td>
<td>-1.38</td>
</tr>
<tr>
<td>Total Cereals</td>
<td>2.13</td>
<td>2.60</td>
<td>1.78</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>1.94</td>
<td>6.50</td>
<td>-1.25</td>
</tr>
<tr>
<td>Chickpea</td>
<td>1.80</td>
<td>3.42</td>
<td>3.13</td>
</tr>
<tr>
<td>Total Pulses</td>
<td>1.79</td>
<td>2.71</td>
<td>0.78</td>
</tr>
<tr>
<td>Groundnut</td>
<td>1.55</td>
<td>-3.00</td>
<td>6.06</td>
</tr>
<tr>
<td>Safflower</td>
<td>NA</td>
<td>2.74</td>
<td>-0.25</td>
</tr>
<tr>
<td>Sunflower</td>
<td>NA</td>
<td>NA</td>
<td>22.53</td>
</tr>
<tr>
<td>Total Oilseeds</td>
<td>2.74</td>
<td>-1.15</td>
<td>7.33</td>
</tr>
<tr>
<td>Cotton</td>
<td>2.38</td>
<td>-1.05</td>
<td>2.55</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>4.57</td>
<td>2.17</td>
<td>5.91</td>
</tr>
</tbody>
</table>

Note: P1 denotes the period from 1955-56 to 1993-94; P2 is 1970-71 to 1979-80 and P3 for 1980-81 to 1993-94.
extension cannot take care of their stability in output and productivity. Vagaries of monsoon play a very important role in determining the output levels, particularly in large tracts of dry areas.

OPERATIONAL HOLDINGS:

The land reform measures introduced in the state covered two broad areas, namely, tenancy abolition wherein the ownership title is transferred to the tenant, and redistribution of surplus land consequent to the fixing of ceilings on the size of landholdings. The operation of tenancy reforms and land ceiling and increase in population resulted in changing the size and organization of agricultural production units in the state. In Karnataka, 0.11 million hectares of land have been declared as surplus, of which 0.05 million hectares have been distributed to 0.03 million beneficiaries (GOK, 1993). The proportion of landless (owning no land) households has declined from 18.64 per cent in the early 60s to around 10 per cent of the total households in 1990.

The total number of holdings in the State has increased from 3.55 million in 1970-71 to 4.31 million in 1980—81 and further to 5.78 million in 1990-91. There was reduction in the average size of holding from 3.20 hectares per holding in 1970-71 to 2.13 hectares in 1990-91 (Table 2). The proportion of households operating less than 2 hectares of land increased from 54 per cent in 1970-71 to 67 per cent of the total households in 1990-91 and their share in the total area operated increased from 15.6 per cent to 27.4 per cent between 1970-71 and 1990-91.
TABLE 2: Number of Holdings and Area Operated by Farm Size Group

<table>
<thead>
<tr>
<th>Farm Size</th>
<th>Number of Holdings (in per cent)</th>
<th>Area Operated (in per cent)</th>
<th>Average Operated Area (in ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 ha</td>
<td>30.45</td>
<td>34.56</td>
<td>39.15</td>
</tr>
<tr>
<td>1 to 2 ha</td>
<td>23.64</td>
<td>24.53</td>
<td>27.45</td>
</tr>
<tr>
<td>2 to 4</td>
<td>22.20</td>
<td>21.30</td>
<td>20.13</td>
</tr>
<tr>
<td>4 to 10 ha</td>
<td>17.54</td>
<td>15.36</td>
<td>11.04</td>
</tr>
<tr>
<td>10 ha &amp; above</td>
<td>6.17</td>
<td>4.25</td>
<td>2.23</td>
</tr>
<tr>
<td>Total*</td>
<td>3551</td>
<td>4309</td>
<td>5778</td>
</tr>
</tbody>
</table>

Note: * Holdings in '000' and Area in '000' ha.

Source: Various rounds of agriculture census. Govt. of Karnataka.
The increases in the number of small and marginal holdings and decline in the share of large holdings both in terms of number and area largely reflect the growing pressure of population. However, it is difficult to estimate precisely the contribution of land reform measures, increasing demographic pressure and conscious circumvention of land reform laws of the government by large landholders in the decline of large holdings. In the northern districts of Karnataka, which is basically a dry land tract, the proportion of small and marginal holdings accounted for 50 per cent of the total holdings. But, the share of small and marginal holdings worked out to more than 75 per cent of the holdings in southern and coastal Karnataka. The average size of the holdings was higher for all the farm size groups in the districts of Northern Karnataka when compared to the average size of holdings for the corresponding land holding class in other parts of the State.

As indicated by Gini Coefficient, the distribution of land is becoming more equitable except in the southern, coastal and Malnad areas encompassing the districts of Mandya, Mysore, Hassan, Chickmagalur, Dakshina Kannada, Kodagu, Shimoga and Uttara Kannada where Gini Coefficient increased by 5 per cent during 1970 through 1990. The value of Gini coefficient for distribution of operational holdings and the area at the state level have declined from 0.51 in 1970-71 to 0.44 in 1990-91 (Bhende M. I and Hanumappa H G, 1995).

PERFORMANCE OF MAJOR CROPS IN DIFFERENT SUB-REGIONS OF KARNATAKA (as delineated by Union Planning Commission):

An exercise was conducted by the Agricultural Development and Rural Transformation (ADRT) Unit at ISEC to find out sub-regional differences (districts were grouped into four sub-regions based on agro-climatic factors as delineated by the Union Planning Commission) (Table 3) in the performance of major crops over 35 years (1955-90) (Bhende M I and Hanumappa H G, 1995). The time series data on area, production and productivity for the period 1955-56 to 1989-90 were divided into 3 sub-periods, namely, 1955-56 to 1969-70 which was designated as Pre-Green Revolution Period, 1970-71 to 1979-80 as the Green Revolution Period, 1980-81 to 1989-90 as the Post-Green Revolution Period. The findings of this study indicate the persistence of certain subsistence crops in quite a few districts which are characterised by dryland agriculture.
### Table 3: Major Features of Different Agro-Climatic Sub-Regions of Karnataka

<table>
<thead>
<tr>
<th>Sub-Region</th>
<th>Districts included</th>
<th>Average Annual Rainfall (mm)</th>
<th>Soil Type</th>
<th>Important Crops</th>
<th>Other Major</th>
<th>High Value Minor Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Belgaum, Bellary, Bijapur, Bidar, Dharwar, Gulbarga, Raichur</td>
<td>769</td>
<td>Clay to Sandy</td>
<td>Low-y, Pulses and Cotton</td>
<td>Groundnut Rice, Bajra</td>
<td>Sunflower Chilies</td>
</tr>
<tr>
<td>3</td>
<td>Mandya, Mysore Hassan</td>
<td>865</td>
<td>Sandy Loamy to Sandy Clay Loamy</td>
<td>Rice, Ragi, Pulses, Jowar</td>
<td>Sugarcane Groundnut</td>
<td>Mulberry</td>
</tr>
<tr>
<td>4</td>
<td>Chickmagalur, Dakshina Kannada, Kodagu, Shimoga Uttara Kannada</td>
<td>More than 1000</td>
<td>Sandy Clay to Sandy Loamy</td>
<td>Paddy, Jowar Ragi</td>
<td>Sugarcane Groundnut</td>
<td>Coffee, Tea, Rubber, Arecanut, Coconut Spices</td>
</tr>
</tbody>
</table>

Source: UAS, Bangalore and ZPT-12, Planning Commission, 1989.

In order to identify reasons for the stagnation of agricultural productivity of food crops during 1980s and problems of new technology in agricultural planning, research, development, extension, water management and the like, a Committee was constituted by the state government under the Chairmanship of T R Satish Chandran. Some of the
important findings of this Committee are summarised below in order to comprehend the problems of agriculture in Karnataka.

Poor to very poor extension efforts failed to adopt the available technology effectively for improving the quality of soils to augment the yield levels. In other words, technological breakthrough in agricultural research occurs in spells and not continuously over a period of time. Connected to this problem is insufficient knowledge with regard to the suitability of different inputs under varied agro-climatic conditions. An important factor in this respect is the suitability of new HYV seeds which were introduced and which failed to perform at the expected levels under varied agro-climatic situations. In terms of fertiliser use, the present level of fertilizer up-take is around 65 kg per hectare. To achieve optimum levels of production, this needs to be substantially increased. By the turn of the century, it is envisaged to reach a level of 120 kgs of NPK per hectare. To reach all the inhabited villages (about 27000 as per 1981 census), the present number of fertilizer outlets will have to be increased substantially. However, sample surveys conducted on the fertiliser use indicate that depending upon the availability of water and its sources, the dosages of N, P and K also vary. Under canal irrigated agriculture, it was found that, while 29 per cent, 27 per cent and 20 per cent of the farmers were using overdoses of N, P and K respectively, 49 per cent, 45 per cent and 57 per cent were using normal doses of N, P and K respectively (Hanumappa H G and Rajasekhar D, 1994).

Crop losses due to pests and diseases also were mild to severe. It is observed that plant protection measures are regularly taken up on high value crops like irrigated cotton, vegetables, oilseeds and plantation crops. It is here that the emphasis on the implementation of an integrated pest management programme needs to be noted carefully. The efforts to protect soil through the soil and water conservation measures are quite inadequate. Satish Chandran Committee observed that, the introduction of HYV and the use of major nutrients (NPK) for higher productivity without the balanced use of organic manure is bound to create problems of micro nutrient deficiency in many situations. The soil testing facilities are not always utilized by the farmers for determining the quantum of application of different nutrients, even though it is recommended in the package of practices. To arrest a stagnant/declining trend in productivity it is necessary to study the changing situation of soil fertility under various cropping systems. Both under rainfed and irrigated situations need to be monitored carefully and understood. This would help in organising an efficient soil management programme without which probably crop yields will continue to
show a stagnant/declining trend (Government of Karnataka, T R Satish Chandran Report, 1993).

Under watershed programmes, the benefits of water conservation practices in dryland areas have been demonstrated. But many evaluation studies have indicated that the productivity increases in watershed areas has been mainly due to seed and fertilizer use rather than the adoption of soil and water conservation practices in an integrated manner. Thus to a great extent, such sub-optimal use of available resources has caused the productivity stagnation in foodgrains.

**IRRIGATION MANAGEMENT**

On the irrigation management front, a biased cropping pattern, more particularly the cultivation of rice and sugarcane by upstream farmers has always resulted in the shortage of water for tail end farmers. Improper water management practices has resulted in the wastage of water by one section of the farmers and scarcity faced by another section. A total change in the outlook of irrigation water management, especially those who belong to the stronger sections of the society and irrigation engineers is called for. Another discouraging issue related to irrigation water management is the abysmally low charges paid by the farmers for water. One estimate reveals that the farmers under canal irrigated areas are almost subsidised to the extent of 95 per cent (Balraj D. Note submitted to Karnataka State Planning Board). In this connection it may be noted that, in the case of farmers using power for irrigation purposes, it is free of charge up to 10 hp. pumpset. This issue continues to bother the government. The debate on power subsidy to farmers in Karnataka is inconclusive (Thimmaiah, 1995).

According to the data furnished in the Satish Chandran Committee Report, the maximum potential area which can be brought under irrigation is estimated to be around 35 per cent of the net area sown. In 1987-88, the percentage of gross irrigated area in Karnataka was 18.7 as compared to 35.4 in Andhra Pradesh, 43.8 in Tamil Nadu and 32.5 in the country. Up to 1991-92, 15 lakh hectares have been developed under major and medium irrigation projects. It is estimated that the area of 13 lakh hectares utilized at the end of 1991-92 is expected to go up to 16.7 lakh ha by the end of the 8th plan which means an addition of 3.7 lakh ha to the area utilised at the end of 1991-92. The percentage of utilisation of potential created up to the end of 1991-92 is 87.32. Though this looks a fairly high percentage of utilization, it is observed that in many major irrigation projects there are wide gaps.
between the potential created and utilised. The gap in utilisation of potential created is due to the slow pace of development of delivery systems—canal distributaries and field channels—as compared to the development of storage structures. Programmes with regard to levelling and other land developments are also slow.

Under minor irrigation an area of 6.73 lakh ha. are covered under 36,600 tanks and about 1 lakh hectares is covered by 434 lift irrigation schemes. The major problem of irrigation projects seems to be the slow progress for want of adequate funds. This has resulted in cost escalation. In other words, it has a direct bearing on the lag in the utilisation of irrigation potential. The delayed construction of the water distribution system and land development promotes violation of cropping pattern. Erroneous water management practices have also resulted in causing water logging, salinity and alkalinity in large areas which require reclamation measures. The present system of water release for crop production in most projects is based on the availability of water in the storages. The distribution is followed at ad hoc intervals rather than based on the actual needs of the crops in the achkat area. These problems add to the lapses in making the agricultural extension effective in the irrigated areas. Another problem is the low level pricing of water for the farmers. As already noted, at present the subsidy in the canal irrigated area is almost reaching 90 to 95 per cent. Considering the high investments and maintenance cost of irrigation water, the water rates have to be adequately high for discouraging farmers from the lavish use of water which does not lead to increased productivity. The rates of irrigation water should be ideal such as to regulate the recurring costs on maintenance of the system and its operation and one per cent of capital investment on the projects (as recommended by the Satish Chandran Committee). The importance of judicious water use will be realised by the farmer only when he has to pay for water service to the quantum used for crop production. Therefore the final objective should be to introduce volumetric system of water charges (Vaidyanathan A). In other words, there is need to provide for measuring devices outlet-wise in each minor sub-distributary. However, it may be difficult to expect that the political will required to operate the economies of irrigation water to the benefit of the entire community will come forth adequately. (Thimmaiah G, 1995).

PRICE SITUATION AND TERMS OF TRADE

On the price front, it is rather depressing to find that very few crops are in a position to command remunerative prices which could really
meet all costs incurred by the farmers. In other words, the ratio of cost of production to farm harvest price has been low particularly in the case of cereals. This ranges between 0.83 and 1.27 (1989-90). Further, the rural economic base continues to be weak due to lack of incentives for encouraging private investment in agriculture. The situation with regard to the growth of public investment in agriculture is also not very encouraging. The terms of trade have been unfavourable for agriculture due to adverse cost price ratios of major crops (Table 4). Trends were not different in earlier years (1981-82 to 1985-86). Due to inadequate economic incentive for growing food crops, there has been a continuous diversion of lands to more remunerative (high-value) crops. But, the resource-use efficiency in high-value crops is also not at the desired level (Rao V. M, Hanumappa H. G and Shylendra H. S, 1993).

Table 4:

<table>
<thead>
<tr>
<th>Year</th>
<th>Farm Harvest Price Index</th>
<th>Wage Index</th>
<th>Composite Index (Wage+Input Prices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981-82</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1982-83</td>
<td>122</td>
<td>111</td>
<td>105</td>
</tr>
<tr>
<td>1983-84</td>
<td>107</td>
<td>122</td>
<td>113</td>
</tr>
<tr>
<td>1984-85</td>
<td>132</td>
<td>134</td>
<td>121</td>
</tr>
<tr>
<td>1985-86</td>
<td>118</td>
<td>155</td>
<td>132</td>
</tr>
<tr>
<td>1986-87</td>
<td>136</td>
<td>164</td>
<td>138</td>
</tr>
<tr>
<td>1987-88</td>
<td>134</td>
<td>185</td>
<td>145</td>
</tr>
<tr>
<td>1988-89</td>
<td>144</td>
<td>208</td>
<td>161</td>
</tr>
<tr>
<td>1989-90</td>
<td>178</td>
<td>228</td>
<td>173</td>
</tr>
</tbody>
</table>


PROBLEMS OF YIELD GAP IN MAJOR CROPS

An important feature of the agricultural productivity in Karnataka has been the persistence of yield gaps across crops and across districts. In the context of the stagnation in crop productivity during 1980-90, an
yield gap analysis may be useful to find out the scope for increasing the productivity of crops when the available technology is adopted at the recommended levels. The analysis based on the findings of a few studies revealed that the yield at the farmers' level varied from 54 to 65 per cent of the yields obtained in the National Demonstrations in case of ragi, redgram and groundnut. Similarly, under the Whole Farm Demonstration Programme, the yield of paddy varied from 48 to 60 q/ha in the demonstration plots as compared to 36 to 40 q/ha in the check plots (non-demonstration) during the years 1989-90 to 91-92. Studies carried out by Agricultural Universities have revealed that for rabi jowar, the farmers' yield was about 64 per cent of the yield of demonstration plots (438 kg/ha v/s 758 kg/ha). Similarly, studies on yield gap analysis of irrigated kharif rice indicated that the yield gap ranged from 76 to 86 per cent in Shimoga and Chitrakurta districts, from 21 to 37 per cent in Raichur and Mysore districts and from 106 to 201 per cent in Kolar and Bellary districts. The highest yield gap in kharif irrigated rice was observed in Belgaum and Uttara Kannada districts (209 percent). In other situations, the yield gap in rainfed situation ranged from 61 to 102 per cent in case of Kharif jowar, under irrigation and in transition belt of the state, the yield could be as high as 2300 to 3500 kg/ha as compared to the existing average yield levels of 1100 to 1200 kg/ha. The gap was 100 to 200 per cent. The yield gap in kharif irrigated ragi was estimated to be 104 to 20 per cent while it was 184 to 219 per cent under summer ragi. The yield gap in maize ranged from 72 to 117 per cent under irrigation. The existing average yield of bajra was 501 kg/ha. and yield potential under irrigation was between 1300 and 2700 kg/ha. The existing average yield of irrigated wheat ranged from 400 - 1100 kg/ha. and it could be as high as 2000 to 2500 kg/ha. Similarly rainfed wheat yield could be increased from 367 to 618 kg/ha. in Dharwad area. The yield gap in groundnut ranged from 79 to 193 per cent under rainfed situation, it ranged from 63 to 303 per cent under an irrigated situation in different zones of the State.

The above findings drawn from various studies/reports clearly indicate the enormous scope for increasing the productivity of food crops provided the farmers can be motivated to adopt the currently recommended practices involving cash inputs through appropriate monetary incentives/price structure.

The Satish Chandran Committee has suggested that high productivity of the crops/cropping system could be achieved by proper allocation of efficient crops to ten agro-climatic zones in the state. Indian
Council of Agricultural Research (ICAR) has delineated 10 agro-climatic sub-regions in Karnataka based on soil, water and climate up to the taluk level. Some of the salient recommendations of the Committee for achieving higher productivity are highlighted in the following two paragraphs:

In Zone 3 (comprising districts of Raichur, Bellary, Bijapur, parts of Belgaum and Dharwad), inter-cropping of groundnut with redgram, hybrid bajra or hybrid jowar with redgram, is recommended for medium textured soils. In black soils, in rabi cropped areas, inter-cropping of Bengalgram and Sunflower in 2:1 ratio is found to be promising compared to their sole cropping. In this zone, in years of better rainfall in medium black soils, groundnut followed by safflower or bengalgram, sunflower followed by safflower/rabi jowar, sesamum followed by ragi, jowar, bajra followed by safflower/bengalgram have been recommended for high productivity. In the fairly well distributed rainfall pattern of Zone No.5 (comprising districts of Chitradurga, Chickmagalur, Hassan and parts of Tumkur) and Zone No.7 (comprising districts of Mandya and parts of Mysore and Tumkur), maize has performed well under rainfed situation as compared to ragi. In years of early onset of rains, cowpea followed by ragi has been recommended. Inter-cropping of redgram in groundnut is found to be profitable.

Possibilities of re-allocation of low productivity crops to high productivity have been the substitution of the area under rainfed wheat by rabi, jowar in Zone-3, intensification of area under bajra, blackgram and groundnut in Zone-2 (comprising districts of parts of Gulbarga), increase in the area under bajra during kharif under rainfed situation in Zone-3 increasing area under maize, groundnut and bajra under irrigation in light textured soils, inter-cropping of redgram with jowar and bajra, greater emphasis on cotton, groundnut, ragi and kharif jowar under irrigation in Zone-4 (comprising districts of Belgaum and Dharwad), increasing area under groundnut in Zone-6 (comprising districts of Bangalore, Kolar and parts of Tumkur), particularly under irrigated situation, increasing areas under kharif jowar and groundnut in kharif, rabi jowar under irrigated situation in Zone-7, increasing the area under cotton, wheat, kharif jowar groundnut, introducing greengram in kharif as a catch crop, a part of area under rainfed rice to be substituted by maize in Zone-8 (comprising districts of Shimoga and Mysore) upland rice to be substituted by ragi, greengram, blackgram, groundnut, cotton in kharif, introduction of groundnut on large scale as second crop after rice with supplemental irrigation in Zone-9 (comprising districts of Kodagu, parts of Shimoga, Chickmagalur, Dharwad and Uttara Kannada) and area under groundnut
and pulses in rice fallows in rabi/summer to be increased in Zone-10 (comprising districts of Dakshina Kannada and parts of Uttar Kannada. The picture that emerges is that the area under foodgrains and oilseed crops has to be decreased and concentrated under more favourable situation to ensure high productivity (and also employment) so that the economic returns under such situations are comparable to returns received from cash crops. The employment implications of this proposition needs to be further probed and in the following an attempt is made to understand this issue.

Thus the situation in Karnataka’s agriculture is one which is characterised by dominance of dryland agriculture with a low proportion of cultivated land under irrigation as compared to states like Tamil Nadu and Andhra Pradesh. Productivity levels are either stagnating or declining due to dominance of problem soils. The introduction of hybrid varieties to some extent helped in augmenting food production, but the state continues to be a marginal state rather than a surplus state.

EMPLOYMENT

Given the structure of agricultural economy of Karnataka which is marked by lower productivity levels making it as a marginal state as far as cereal production is concerned. This also limits the scope for absorbing the surplus labour. NSS data on employment indicates that the growth rates of rural employment (usual principal and subsidiary status) in Karnataka is much lower than in India. The growth of rural employment recorded 0.97 per cent between 1977-78 and 1987-88 and remained much below the all-India level of 2.19 per cent (DES, GOI. Study on Trends in Employment Unemployment in Karnataka, 1995). From the point of the average number of employment days of male agricultural workers per annum, Karnataka’s performance varied marginally with that of all-India average (Table 13).

The slow growth rate recorded in he rural employment indicated the limited scope for additional employment generation in the agriculture sector. Employment elasticities are not encouraging in the rural sector. A study on Labour Utilisation in Agriculture has found that employment elasticities are ranging between 0.5 and 0.7 (Sathyapriya, V. S., 1990). The growth rate of additional labour generated exceeded the rate of growth of rural employment. However, it can be noticed with the help of published data on Karnataka, that, there has been consistent increase in the proportion of workers employed in non-farm activities. It increased from
15.2 per cent in 1977-78 to 18.7 per cent in 1987-88. But the increase in this sector has absorbed more male workers on a consistent basis than female workers. There are certain marginal differences in the estimates prepared with the NSS data and census data (Rajasekhar D, 1995).

The NSS data as analysed by Rajasekhar indicates a higher level of non-farm employment as compared to census data. An interesting feature of growth of non-farm employment is that manufacturing, construction and wholesale and retail trade activities have been the dominant sources of rural non-farm employment. Across districts of Karnataka, the coastal districts (Dakshina and Uttara Canara), Bangalore, Kolar, Tumkur and Chitradurga recorded an impressive increase while districts like Bidar, Chickmagalur and Dharwar, Kodagu and Mysore as well as Bellary, Gulbarga and Raichur recorded a decline in the proportion of male employment. High diversification has been witnessed around Bangalore City including Kolar and Tumkur districts. According to Rajasekhar's exercise conducted on the basis of secondary data for Karnataka, the growth in the proportion of male workers in the non-farm employment can be attributed to growth related determinants like agricultural development, linkages of non-farm sector with agriculture etc. But the declining trend in the proportion of female workers is attributed to poverty related factors such as unemployment, low wages and high incidence of poverty. However, these propositions need to be examined carefully and substantiated on the basis of primary surveys.

Table 13:
Average Employment Days of Male Agricultural Workers Per Annum for Karnataka and India - 1964-65 to 1983.

<table>
<thead>
<tr>
<th>Year</th>
<th>Karnataka</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964-65</td>
<td>228</td>
<td>217</td>
</tr>
<tr>
<td>1974-75</td>
<td>204</td>
<td>193</td>
</tr>
<tr>
<td>1977-78</td>
<td>n.a.</td>
<td>229</td>
</tr>
<tr>
<td>1983</td>
<td>226</td>
<td>227</td>
</tr>
</tbody>
</table>

PART TWO

KARNATAKA AGRICULTURE: POLICY FRAME AND INITIATIVES

The Agricultural Policy Resolution adopted by the Government of Karnataka in 1995 (Govt. of Karnataka, 1995A) is by and large based on the following guidelines:

1. Land and land use policy to improve growth prospects

2. Policy to improve yields and achieve self-sufficiency in food grain production.

3. Policy towards increasing the availability and improving efficient use of scientific inputs and other supporting services like credit.

4. Policy to provide adequate research, education and extension support for accomplishing (2) & (3) above.

5. Policy to reduce regional imbalances in agricultural development within the state by identifying the needs and growth potentials of different sub-regions based on agro-climatic conditions.

6. Policy to sustain the growth in output and yields through creating proper marketing and pricing structure.

7. Potential for growth in other sub-sectors.

From the above it is clear that, the Agricultural Policy Resolution of Karnataka state emphasize that agriculture production policies need to aim at achieving higher growth rates which would help in meeting the requirements of the state. It would be worthwhile to examine the above policy guidelines in the light of Karnataka’s experience in agricultural development.

1. LAND AND LAND USE POLICY TO IMPROVE GROWTH PROSPECTS

Keeping both economic and social equity in mind the Karnataka government made several amendments to land acts and brought about reforms from time to time. But the consequences of these reforms have been mixed. The major change in the ownership of land holdings emerged after the enactment of Land Reforms (Amendment) Act 1974. The implication of this Act has been aptly summarised by Thimmaiah and Aziz as follows: “....the provision of 1974 Act are more radical than those passed by any other State in India in that the ceilings were fixed at the
minimum suggested by the Central Government and the law provided for non-resumption of leased out land and also for the abolition of tenancy. Obviously the noose was tightened rather hard around the necks of landed interests both on the tenancy and on the land ceiling issues. This proves the point that in the interplay of group interests, the landlords had lost their traditional hold on the policy making apparatus" (Thimmaiah and Abdul Aziz; p.70). Another important impact of this reform was that, over a period of time the number of uneconomic holdings increased adding to the poverty levels among the small and the marginal farmers of the state. Green Revolution benefits were restricted to farmers with irrigation facilities and those who had to depend on dryland agriculture continued to face hardship. Basically the land utilisation in the state was determined by the pressure of population on the land. Consequently the extent of marginal lands under cultivation gradually increased causing environmental problems. The Agricultural Policy Resolution recommended amendments to the land acts to facilitate certain agricultural activities to be taken up as commercial enterprises. The government of Karnataka has already passed necessary legislation by amending the earlier land reforms act.

2. POLICY REGARDING IMPROVEMENT IN YIELDS AND SELF-SUFFICIENCY IN FOODGRAINS.

In view of the scarcity of land as mentioned above, the major strategy of the agricultural policy of the state government has been to concentrate on yield growths. The growth of output and productivity of principal crops indicate a very optimistic trend (during early 1990s). Among the crops sugarcane, bajra, wheat, maize and tur have impressive growth rates. While growth rates achieved in the output of rice, wheat and sugarcane are due to availability of irrigation and new seeds, the growth rates achieved in dry crops like ragi, bajra, maize and cotton are mainly due to success of the technology in dryland agriculture. It is important to note here that rice, ragi, jowar, maize, pulses and oil seeds are the crops which reveal very good growth potential apart from the low volume high value crops like mulberry.

The level of food grain output is dependent on the decision making process of small and medium farmers as more that 75 per cent of the area under food crops are covered by holdings below 10 acres. In other words the agricultural census data indicates an inverse relationship between the size of holding and the area allocated for food crops. It is also a fact that over the years the average size of holding per household is
declining and with the introduction of new crops like sericulture and also farm forestry programmes, forces of higher commercialization are likely to shift away areas under food crops. While such a shift is welcome, its impact on the overall food economy of the state has to be carefully looked into. In view of these features, Karnataka remains as one of the marginally deficit states. This situation (quite frequent in recent years) gets aggravated in drought years. A cumulative effect of recurring droughts pull down the pace of development and increases the proportion of those living below the poverty line. At present an effective public distribution is looking after the food grain needs of the poorer sections. This calls for policy of growth with equity. These oft-repeated twin objectives of development require a strategy which should emphasize the need to raise the food output through higher yield rates. In this respect the Agricultural Policy Resolution has emphasised the need to promote research and development activities both by the Agricultural Universities as well as other agencies on a priority basis.

3 POLICY TOWARDS INCREASING THE AVAILABILITY AND EFFICIENT USE OF INPUTS AND OTHER SERVICES INCLUDING CREDIT:

On the irrigation front, it is estimated that by the turn of the century, the area under irrigation is likely to be around 25 lakh hectares of cropped area. One of the major problems faced by the irrigation department is the wastage of canal water by farmers and absence of proper water management practices. Steps have been initiated to ensure optimum and efficient use of irrigation water and make it available to increased areas. The Warabandi system is introduced and practiced effectively in project areas. Prevention of alkalinity and salinity due to excessive use of irrigation water is necessary to protect the soils from getting degraded. In this connection, the encouraging results of pilot projects on bio-fertilisers need a careful review and programmes for popularising different varieties of bio-fertilisers have to be formulated.

Utilisation of power for agricultural purposes has been increasing year after year. Even then the proportion of power used for agriculture remained around 8.2 per cent (607 million units out of total utilisation of 7264 million units in 1994-95). Measures to establish proper linkages with rural electrification programmes to ensure better utilisation of power for the agriculture sector have to be taken.

Infrastructure facilities for production, processing and marketing of quality seeds need to be improved further. The seed replacement rates
aimed at 100 per cent for hybrid, 25 per cent for cereals and 15 per cent for pulses and oil seeds (except groundnut at 10 per cent) have to be achieved. Both government and private efforts will have to be encouraged and the programme envisaged for establishing seed banks to meet contingency situations needs a review. There is need to emphasize for a programme of advance stocking of certified seeds in dry land areas (villages). Production of seed in a phased manner should be planned. Government subsidy to producers who face adverse seasonal conditions to prevent non-viability of these ventures needs to be provided.

Plant protection measures need a special mention as the demand for technical grade material is likely to be around 4000 to 5000 tonnes in Karnataka due to more area coming under high yielding varieties and hybrids. A phased programme to have pesticide testing laboratories in the state is essential.

Other activities like establishing soil health centres / issuing soil health cards to tackle problems of alkalinity, salinity and acidity of soil to develop improved agricultural practices need to be encouraged.

Credit requirement for agricultural activities in Karnataka is estimated around Rs. 3,500 to Rs. 4,000 crores annually (latest estimates put this figure at Rs. 5,000 crores) and the availability of credit through institutional outlets is about 20 to 25 per cent of this requirement. It is extremely important to strengthen the institutional credit structure to meet the demand of the farmers. The service area approach introduced by NABARD has to keep in mind the credit gap in the state while estimating credit needs. The Agricultural Policy Resolution has suggested the establishment of a state level institution on the lines of NABARD for providing re-finance facilities to district and below level institutions so that they need not be at the mercy of NABARD.

Crop losses due to frequent failure of monsoons has been considered and it is suggested to formulate suitable policies to introduce a system of crop insurance for protecting the farmers' interests.

4 POLICY TO PROVIDE ADEQUATE RESEARCH, EDUCATION AND EXTENSION SUPPORT

Research in agriculture, animal husbandry, food processing etc., will have to be oriented to increase the profitability of smaller farms and dry farming systems. Emphasis will have to be laid on integrative and versatile technology inputs for the small farmers and for the neglected
areas. Research in frontier sciences such as bio-technology and genetic engineering will be integrated with agricultural research. The agricultural extension system will be made more broad-based so that it can efficiently transfer technology to the farms in various land-based activities-crop husbandry, animal husbandry, horticulture, agro-forestry etc. Reorientation of the extension system would involve extensive retraining and much closer linkage between research and extension.

5. POLICY TO REDUCE REGIONAL IMBALANCES IN AGRICULTURAL DEVELOPMENT WITHIN THE STATE BY IDENTIFYING THE NEEDS AND GROWTH POTENTIALS OF DIFFERENT SUB-REGIONS BASED ON AGRO-CLIMATIC REGIONAL PLANNING

The dominance of the rainfed cropped area (more than 61 per cent of the gross cropped area) would call for new approaches for agricultural development of the State. Apart from bringing about technological innovations at the level of individual farming, need has arisen for organising farming activity to augment the capabilities of land through an integrated community-based approach. The efforts to popularise the watershed development programme has yielded mixed results. In spite of certain constraints, watershed development seems to be the right answer to overcome the instability of dryland agriculture. Under watershed, the farming activity will take place on the basis of the potentialities of area covered by watershed which, in turn will be determined on the basis of agro-climatic characteristics. The community-based watershed approach can assure use of certified seeds, adequate fertilizers and pesticides and help in increasing the productivity in agriculture. In other words, it is now recognised that an approach to promote sustainable agriculture needs to be evolved and this would call for an integrated view of the scientific use of land and water resources. This approach would imply a shift from a system of seasonal crop cultivation to a farming system approach for optimising the use of land and water resources, which will maximise the farmer's income as well as employment opportunities for the rural labour. Effective land use on a sustainable basis calls for measures leading to permanent vegetation such as horticulture, agro-forestry, permanent pastures, etc., specially in ecologically fragile areas i.e., hilly slopes or land with poor soil mantle. The Agricultural Policy Resolution has recommended the constitution of the District Planning Committees (DPCs) under the Panchayat Raj System in order to formulate decentralised agricultural development plans for districts on the basis of the concept of agro-climatic regional planning developed by the Union Planning
Commission. In other words, area planning based on local soil, water and climatic conditions need to be encouraged which will facilitate meaningful development.

There is an increasing trend in the per capita incomes (both rural and urban) which has increased the demand for products of horticulture, livestock and fisheries. This trend is likely to continue. Agriculture sector will be in a position to respond to this demand impulse appropriately only when it can make the most efficient use of land and water resources in a farming system approach, optimising the use of both land and water. An important point to be remembered here is that the government would take measures to ensure that raising yields per unit area is compatible with safeguarding environment.

6. POLICY TO SUSTAIN THE GROWTH IN INPUT AND YIELDS THROUGH CREATING PROPER MARKETING AND PRICING STRUCTURE

In addition to a built-in system of incentives from an equitable land-tenure system, the farmer needs, amongst others, three important services to increase his production and productivity, namely, (1) incentive prices (2) profitable technology and (3) input services support.

Agriculture has to be treated as a business proposition which has its own structure of costs and returns (prices). The farmer is a businessman making use of his assets like land, equipment and labour to generate a surplus. But the terms of trade are against the farmer in the Indian situation. This anomaly needs to be removed and unless the farmer finds his occupation profitable, he would not be interested in adopting any technology. The success of wheat, rice, milk, cotton and oilseeds in certain pockets has proved that the farmer will adopt technology only when he sees profitable/remunerative output prices and reasonable input prices.

Subsidy in the agriculture sector particularly for fertilizers and electricity does not represent waste. A majority of the Karnataka farmers are small and medium holders and they cannot be motivated merely through the incentive output price since they may not have much marketable surplus. It is of utmost importance that the input prices are also held at reasonable levels to motivate farmers to use inputs like fertilizers and water to increase their productivity on scientific lines. Hence a combination of input subsidy and incentive prices is extremely essential to ensure reasonable profits to all sizes of holdings which alone can optimise efficiency and quality. Withdrawal of such subsidies would lead to a loss
of output, yields and jobs leading to sub-optimal socio-economic equilibrium. The management of the agricultural sector with a right price policy is therefore extremely essential to optimise production, employment and income. For most of the poor people food constitutes nearly half of their family budget. Reasonable prices of foodgrains resulting due to a high level of output which is made possible by the right combination of input subsidy and incentive prices, will contribute to the overall welfare of the society. In the ultimate analysis, it is neither the farmer nor the industry which is subsidised; it is the user of the agricultural produce including the consumer of food and raw material like fibre, who is the beneficiary.

7. POTENTIAL FOR GROWTH IN OTHER SUB-SECTORS

Animal husbandry development programmes which are mainly based on high-yielding milch cows have made a great deal of progress in boosting milk production. Even though co-operativisation of dairy programmes for procurement, processing and marketing under the Operation Flood has facilitated especially all viable dairy units, growth in this sector has however been uneven. With improved productivity through harnessing of scientific research it should be possible to increase production and procurement and spread of consumption of milk and milk products to much larger sections of the society. In many of the dry districts of Karnataka sheep and goat husbandry has enormous potential to improve the incomes of the landless.

Poultry development has also made significant progress recently. Better management techniques especially in the small poultry units can assist the rural people to supplement their incomes. Better marketing and minimum support prices can put poultry industry on a sounder footing.

Horticulture sector is responding to the improvement in incomes. This has increased the demand for fruits and vegetables which is an important source of nutritious food for larger segments of the population. Being highly perishable, efficient marketing and storage is crucial. The promotion of dryland horticulture can play a crucial role in many of the dry districts of Karnataka. Both domestic as well as international demand for horticultural products of Karnataka is on the increase. There is a tendency towards corporatisation of horticultural activities. The Karnataka Agricultural Policy announced by the Government of Karnataka has emphasized the need to establish new institutions for encouraging entrepreneurs to go in for more horticultural activities.
Sericulture is another area where Karnataka is known. It produces nearly 60 per cent of the total silk output of the country. The backward and forward linkages established in the sericulture activities in terms of efficient marketing system for cocoons and raw silk have helped the farmers in a big way. The spread of sericultural activities in new areas of Karnataka in recent years clearly indicates the interest of the state government to increase the employment opportunities through sericulture.

Fisheries is predominant in two coastal districts and there is potentiality for improving the production of fish from marine sources. There are also a number of water resources for developing inland fisheries like tanks and ponds, lakes, reservoirs, rivers etc. The fisheries development schemes will have to be oriented towards achievement of higher production and productivity as well as optimum utilisation of resources. There is need for development of marketing of both fresh water and marine fish through establishment of a chair of cold storages both at the landing sites as also in major markets for the benefit of both consumers and producers.

Social forestry/farm forestry has been considered as an important requirement for maintaining environmental balance. Already a number of social forestry programmes are being implemented in the state and farmers are being encouraged to take up farm forestry programmes from the point of view of both income generation and effective use of marginal lands particularly through credit support.

It should also be remembered that nearly half of the labour input in agriculture comes from women and women farmers have been sorely neglected. Women though owning land, are often denied credit facilities. There is need for the extension machinery to get appropriately reoriented and strengthened to assist women farmers and workers so that they can contribute to increased efficiency and productivity of the farm sector.

Involvement of non-governmental organisations including voluntary agencies will help promotion of agricultural development with peoples' participation. Karnataka government has adopted the Panchayat Raj Institutions (PRIs) to bring about meaningful decentralised planning. The PRIs, in full consultation with the farmer should be in a position to make necessary arrangements to reach various inputs to the village level in advance of the production season. The monitoring and evaluation machinery will take care of the concurrent evaluation of these services and help in improving upon their efficiency.
PART THREE

PROSPECTIVE ISSUES AND CONCLUSIONS

There have been a number of changes taking place in India under the policy of New Economic Policy (NEP). Under NEP, the economy is expected to aim at improving efficiency of different factors of production (Hanumantha Rao C H, 1995). Despite many challenges thrown up by NEP, attempts are at work to promote agricultural activities by bringing about changes in the functioning of the agricultural extension system, input delivery system, growth in the allied sectors like animal husbandry and so on. Like in many other regions of India, in Karnataka also, the impact of these changes on agricultural growth and development has been marginal. In other words, attempts to accomplish greater efficiency through productivity gains have been marginal and in some cases negative. This indicates that, agriculture needs to become more competitive (Thimmaiah G, 1994). It can become more competitive provided it attracts more public and private investment, more efficient use of inputs which presupposes adequate and timely supply of high quality inputs, create scope for competitive pricing and proper infrastructure support, improved extension system supported by R&D efforts of research institutions (mainly agricultural universities) which can promote both agricultural and rural development (Govt. of Karnataka, 1995A). In this regard, the efforts of multinationals involved in high-tech agriculture have already shown a way out (Hanumappa H G, 1992). Several private seed companies have organised farmers (including the small and marginal) in selected districts of Karnataka to produce high quality seeds, both for domestic and foreign markets. The success story of farmers of Ranibennur taluk (erstwhile Dharwad district) has opened up possibilities of organising farmers of dry regions for carrying out high-tech agriculture. But training the farmers is of utmost importance for reorienting them to take up new activities. In this context, it is necessary to involve Non-Governmental Development Organisations (NGDOs) in the field of training and mobilizing the rural poor to face the challenges of liberalisation.

Another interesting phenomenon which needs to be noted in Karnataka’s agriculture is the changing dualistic structure within agriculture. On the one hand, the crop sector-particularly the foodgrain sector still depends on improved research and extension services to augment productivity. On the other hand, an highly efficient agro-based sunrise industries in the areas of horticulture, floriculture and the like have shown significant progress in both production and productivity. Under this
process, while the more enterprising will benefit by participating in the liberalisation process, the resource poor population are likely to remain as onlookers, since their ability to compete in a free market situation is extremely limited. Hence, before resorting to any major reforms in the name of liberalisation, it is necessary to provide for a safety net to the poor and the deprived (Govt. of Karnataka, 1995A), so that, as agriculture becomes more and more competitive, the poor deserve greater opportunities to get accustomed to participate in a more competitive manner rather than allowing them to remain as helpless spectators.

* * *

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